than 100° Fahr. This Act may be said to have been entirely without effect on the refined petroleum sold for use in lamps and, another Act, passed in 1868 to amend it, has been but little more effective in this respect; so that the facts as to the storage and sale of mineral oil, of all degrees of inflammability, remain much the same as they were before.

The abortive character of this Act is probably to be ascribed, in great measure, to a conflict of interests, supposed to be opposite, when the bill was before Parliament and a further reason for its inoperative character, consists in the absence of any sufficient or fitting organisation for carrying out its provisions and regulating the trade in mineral oil. Strange to say, the licensing bodies have, generally speaking, no power under the Act to inspect and test mineral oil, except as a condition of licenses granted by them and the persons who are specially authorised by the Act to inspect and test, are not in most cases under the control of the licensing bodies. Of still greater influence in nullifying the provisions of the Petroleum Acts, is the want of any properly-constituted authority for instituting proceedings in cases where those provisions have been infringed. Any person may prosecute; but, as is generally the case with a duty so general, everyone leaves it for some one else to do so.

But perhaps one of the chief reasons why the Petroleum Act of 1868, has proved inoperative, is to be found in the unsatisfactory nature of the test by which the fitness of mineral oil for domestic use is directed to be ascertained and in the vague terms by which the operation of testing is described in the schedule appended to the Act. The point to be ascertained is the temperature at which mineral oil gives off inflammable vapour and, since any danger that may arise in this way, would exist chiefly in the ordinary use of the oil in lamps, it would seem to be an obvious necessity that the test, applied to ascertain that point, should be conducted under conditions as nearly resembling those obtaining in the actual use of the oil as could possibly be devised. The Act, however, prescribes a test under conditions which are the direct opposite of these. In using a mineral oil lamp, the oil is heated in a closed vessel partly filled with air; in testing the oil it is directed to be heated in an open vessel with the surface of the oil freely exposed to the atmosphere. In the test, any vapour that is given off from the oil is liable to be blown away by draughts and by diffusing into the surrounding air, to become so much diluted as to lose its inflammable character; while, in the lamp, any vapour given off is confined and forms an explosive mixture with the limited quantity of air contained in the oil reservoir. There is indeed, generally speaking, little real danger attending such a result as this, for the quantity of inflammable vapour produced in the reservoir of a lamp would rarely be sufficient to cause any dangerous explosion; but the flash resulting from the ignition of this vapour, would certainly be enough to startle almost any persons and cause them to drop the lamp. It is probably in this way that many of the accidents with mineral oil have taken place, since the lamps are very generally made of glass and since the oil readily takes fire when spilt upon linen, paper, or any such material.

Besides this cardinal defect in the prescribed test of mineral oil, the various directions given for conducting it are so vague and general, that they leave much to the fancy and option of the operator. Moreover, it is to be doubted whether inspectors of weights and measures, who are the persons authorised under the Act to test mineral oil, are generally competent to conduct these tests in a satisfactory manner.

Although the Act has been in operation only a few months, it has already given rise to much difficulty and inconvenience, without being productive of any benefit. Within the last few weeks, a series of trials of mineral oil, purchased indiscriminately at shops in various parts of the metropolis, has brought to light the fact that, out of 75 samples thus obtained, 39 of them were below the legal standard in regard to inflammability, when tested in strict accord with the directions of the Act.

These facts are sufficient to show that there is great need of further legislative action in this matter; this need has long been felt by those engaged in the mineral oil trade and there is every reason to believe that a well-digested enactment, providing for the safe transport, storage and use of mineral oil, would be of great benefit, not only to the public at large; but also to those engaged in all branches of the trade connected with this useful commodity.

HOSPITAL CONSTRUCTION

An Address on the General Principles which should be Observed in the Construction of Hospitals. Delivered to the British Medical Association at Leeds, by Douglas Galton, C.B., F.R.S. (London: Macmillan and Co., 1869.)

THIS able address with the discussion which followed it, brings fully before us the question of hospital construction. The Address itself is exclusively practical: it goes direct to its object and, by appealing to the results of every day's experience of the benefit of cleanliness, space and fresh air; it points out how these essential elements in the management of the sick, have been embodied in recent hospitals and it indicates by implication, what errors should be avoided.

After stating briefly the work done in this matter by different Sanitary commissions in this country, Mr. Galton gives the following enumeration of objects which must be attained in hospital buildings:—

> "1. Pure air, that is to say, there should be no appreciable difference between the air inside the ward and that outside the building.
>
> "2. The air supplied to the ward should be capable of being warmed to any required extent.
>
> "3. Pure water, so supplied as to ensure the removal of all impurities to a distance from the hospital.
>
> "4. The most perfect cleanliness within and around the building."

To realise these conditions the first step in hospital improvement is to select healthy sites, away from irremovable sources of air impurity and, having by this means obtained a pure moving atmosphere, the author proceeds to show how the site is to be used so that the pure atmosphere may not become a disease generator in the wards. The building must be so arranged as to interfere as little as possible with the free, natural movement of the outer air and this free outside movement should be kept up, as far as practicable, within the wards. "Stagnant air is foul air," especially in a hospital.

It has been experimentally shown that ward-air moves most readily when care is taken to combine as far as possible the following requirements:—1st, To let the prevailing outer air currents strike the *sides* of the wards; 2nd, To provide that the sun shall shine on the opposite sides of the wards every day he shines: 3rd, To have windows on opposite sides of the wards, with the beds arranged between them. A proper use of these opposite windows is the *sine quâ non* of ward ventilation and of ward healthiness. But, in cold variable climates, provision has to be made for graduating the ventilation and for warming a portion of the air.

The subsidiary means which have been found to answer in practice are foul air shafts, fresh air inlets close to the ceiling, and warm air stoves—of a peculiar construction described in detail—so contrived that, while the ward is heated by radiant heat, the air warmed is not ward air but fresh air.

The cubic space per patient is determined primarily by the superficial area per bed, which, in its turn, is determined by the area required for efficient nursing. From 90 to 100 square feet per bed is sufficient, except in hospitals where there are medical schools. The cubic space per bed hence depends on the height of the ward.

There is but one test of ventilation and that is freshness of the ward air. No quantity test is of any avail, hence ventilation, that is, the proper use of the means of ventilation, is an essential part of ward administration. No man or woman who has not a sensitive nose and who has not also a perfect horror of bad smells or closeness, should ever take office in a hospital.

The central point in hospital construction is the ward itself and the following figure shows the usual arrangement of the ward and its offices, in the new class of hospitals.

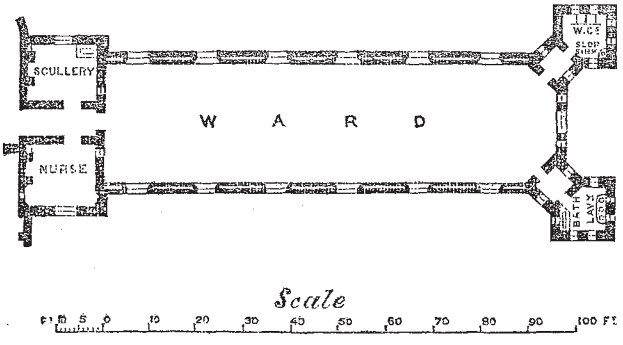

FIG. 1.

On one side of the entrance is placed a nurses' room; on the other side of the entrance is placed a small scullery. In the ward itself the beds are arranged two and two along the wall spaces between the windows, with a bed at each corner. At the further end of the ward is a large end window. On one side of this window there is a building, thrown out from the corner, in which are placed the water-closets. The other building, at the opposite corner, contains the lavatory and bath-room.

The next figure shows the simplest arrangement of these ward units in a regimental hospital. Such a building can be constructed on one or two floors. The administrative portion, together with two or four small wards for special cases, occupies the centre of the block and the kitchen is detached. The larger wards project at either end. (A, fig. 2.)

A very important question, raised by Mr. Galton, is the manner in which hospital accommodation should be provided for recurring epidemics, fevers, cholera and the like. He shows that the cheapest and most effectual provision consists of temporary huts, a result which we commend to those who consider that large, costly, permanent fever hospitals are necessary for London.

With this general statement of the principles we must refer our readers to the address itself for the numerous points of detail which require to be attended to for securing due care and prompt attendance on the sick. They are all in strict accordance with scientific requirements and, if intelligently applied, will save many valuable lives.

We wish we could say as much of some portions of the discussion which followed the address. We allude to the obtrusion of the "germ" disease hypothesis into the hospital question. This theory, it is true, met with little countenance from the meeting; but there it was. In one sense its introduction was useful as showing what the final results of such a doctrine are. Of disease itself we know little scientifically as yet; nevertheless, it has become a fashion of late to supplement lack of knowledge by assuming that certain diseases are separate specific existences like animal or vegetable species, each springing from a "germ" or seed introduced from without; hence in the discussion it was averred that the supposed destructive influence of carbolic acid on these "germs" can be made to supply the place of fresh air in hospital wards, and, as a consequence, that the danger has to be encountered, not in foul air but in disease "germs."

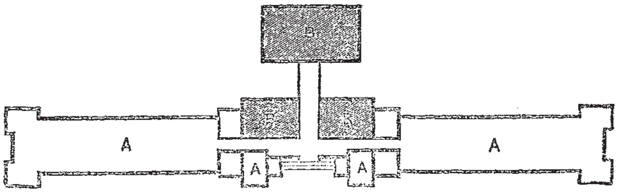

FIG. 2.

There may be disease "germs" for anything we know; but, until their existence is proved physically and until it is shown that there are germs with different distinctive specific characters, each of which germs can be shown to produce always the same group of symptoms in the human body, which symptoms can arise from no other cause; we can in no sense recognise the existence of disease germs. In scientific questions of this kind, "*de non apparentibus et de non existentibus eadem est ratio.*"

To neglect the ventilation and other sanitary arrangements of hospitals for a mere theory, would be to undo all that has been done in hospital improvements in Europe, with the inevitable result of destroying life.

Mr. Galton concludes his paper with some pertinent remarks on the cost of useless ornament in hospitals, which we commend to the consideration of hospital architects. Hospital resources are limited, patients are many—too many we should say.

Miss Nightingale begins her admirable "Notes on Hospitals"—a book which has done great good—with this startling passage:—"The very first requirement of a hospital is that it should do the sick no harm." Have hospitals, then, done harm to the sick? We are sorry to say that there are few of the older, badly constructed, ill-ventilated hospitals in any country which have not their calamitous records of immense death rates at all times and, especially, during epidemic seasons.

No one can read Mr. Galton's address without recognising that, from first to last, it is a protest against hospitals. Why are all these precautions and costly appliances necessary, unless it be to enable the sick poor to be grouped together in hospitals without destroying their lives?

Are not all these precautions a tacit admission that in breaking the family tie, in sickness, we are acting against Nature? She has bestowed the "family" with its common joys, sorrows and duties, on the human race. If, in order to aid the poor in sickness, it is necessary to break up the family tie and to expose the sufferers to risks in hospitals which they might escape at home, we would suggest whether there be not a prior question—namely, whether we cannot improve the dwellings of the people, make them better adapted for sickness as well as for health and thus look forward to the abolition of hospitals altogether.

We are, as yet, far from this consummation and, if we must have hospitals, we are bound to make them not only harmless, but useful. Mr. Galton has added a valuable contribution to the literature of hospitals in showing how this may be done.

ENTOMOLOGY IN AMERICA

A Guide to the Study of Insects and a Treatise on those Injurious and Beneficial to Crops: for the Use of Colleges, Farm-Schools and Agriculturists. By A. J. Packard, Jun., M.D. With upwards of 500 Engravings. Parts I.-VIII. (Salem: published by the Essex Institute, 1868-69. London: Trübner and Co.)

IT must be confessed that our American brethren are inclined in the present day to advance in the study of natural history, as in everything else. We can call to mind a dozen or more thriving institutions for the advancement of Science, especially natural history, in various towns in the United States, some of the names of which are hardly known to us, except by their scientific publications.

The Governments, both of the whole Confederation and of the different States, show a liberality in patronising scientific researches and in diffusing the results of those carried on under their auspices, which we should be glad to see imitated nearer home. A great number of American naturalists enter boldly upon investigations which but few of their distant relations on this side of the Atlantic, seem inclined to take up: their papers are generally of interest, and, not unfrequently, of great value.

In no department of zoology are the zeal and energy of the American naturalists more clearly shown than in the study of entomology. Doubtless, in the United States, as elsewhere, there are a great many amateurs, who rush into print with crude notions and write perhaps too hastily; but amongst the American entomologists there are several who are doing excellent work in the elucidation of this branch of the natural history of their country and even attacking groups, such as the *Ichneumonidæ*, in face of which German or Scandinavian pertinacity recoils baffled, or makes but little way.

Dr. Packard, the author of the "Guide to Entomology," of which eight parts (out of ten) are now before us, is well known as a writer on American insects, chiefly Hymenoptera and Lepidoptera,—he has also made some original investigations upon the anatomy and physiology of insects. The first portion of his book, occupying nearly two parts, is devoted to general entomology and furnishes an admirable, though necessarily brief, account of their organisation, of their reproduction and development in the egg and of their metamorphoses. The most recent memoirs connected with these subjects, have been made use of by the author and this part of his work is certainly the best manual of entomology which the English reader can at present obtain. The author concludes the general section of his work with directions for collecting and preserving insects, followed by a short bibliography and then proceeds to discuss the classification of insects.

In his classification, Dr. Packard departs somewhat from the generally received views, especially in regarding the class of insects as including, along with the true six-footed and generally winged forms, the Spiders and Myriapods, which have either eight or many feet. It is true that the Myriapods approach the true insects very closely; but the passage indicated by Dr. Packard from the Diptera to the Spiders appears to be founded solely on superficial resemblances and it by no means warrants the union of the *Arachnida* with the Insecta, although that of the *Myriapoda* may perhaps be accepted. Of course, as the boundaries of the class of insects are thus enlarged, the true insects of other authors have to occupy a lower rank in the system and Dr. Packard treats them as forming a single order of his class insects. He then adops the usual seven ordinal divisions as "sub-orders" and indicates their arrangement in two slightly divergent series as follows:—The Neuroptera, or lace-winged flies, form a common starting point, from which issue, on the one hand, the Orthoptera, Hemiptera and Coleoptera; on the other, the Diptera, Lepidoptera, and Hymenoptera, the latter series being the highest. The author does not state that he regards this as a genealogical tree, or as expressing the course of evolution of the groups; in any case the relationship of the Hemiptera to the Coleoptera does not seem very clear.

These slight objections to some of our author's theoretical views of classification do not, however, apply in the least to his exposition of the classification itself, which is admirably clear and complete. Under each order he gives a general account of the structure and habits of its members, followed and illustrated by a more detailed description of the characters and mode of life of particular species, arranged under their respective families. The examples selected by the author consist, for the most part, of the commonest species inhabiting the United States, a circumstance which will necessarily form a little drawback to its usefulness in this country; although, from the fact that great numbers of the North American insects have their allies, if not representatives, in Britain, the descriptions of habits, at any rate, will be generally applicable.